

What is claimed is:

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1. A method comprising:

2 defining a pattern to be formed on a textile material,  
3 which pattern represents different degrees of change of said  
4 textile material at different locations, said different degrees  
5 of change including at least a plurality of different levels of  
6 change; and

7 producing a viewable display representing said pattern.

1 2. A method as in claim 1 wherein said pattern includes  
2 effective applied power density information which enables said  
3 change to be carried out with a laser.

1 3. A method as in claim 2 wherein said applied power  
2 density levels are individually associated with different  
3 portions of said pattern, and include information which changes  
4 an energy density per unit time applied by the laser.

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1 4. A method as in claim 1 further comprising using a  
2 laser to scan lines defining said pattern onto a garment, by  
3 controlling said laser according to said pattern to apply energy  
4 across different lines which are produced across the pattern, at  
5 least one of said lines including plurality of different  
6 effective applied energy on a single line.

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1 5. A method as in claim 1 wherein said viewable display  
2 includes a plurality of different sections, and further  
3 comprising accepting commands on a user interface that enable  
4 each of said sections to be separately controllable on said  
5 viewable display, to produce a different degree of viewed change  
6 on said viewable display.

1 6. A method as in claim 5 further comprising converting  
2 said sections to scan lines in a desired direction, and using a  
3 laser to produce a desired effective applied energy based on  
4 said pattern, to produce a desired output along said scan lines,  
5 at least one of said scan lines having a different effective  
6 applied energy at a central portion as compared with at either  
7 end portion thereof.

1 7. A method as in claim 6 wherein said scan line is a  
2 horizontal scan line.

1 8. A method as in claim 6 wherein said scan line is a  
2 vertical scan line or any angled scan line.

1 9. A method as in claim 6 wherein said using a laser  
2 comprises changing an effective power output of the laser while  
3 scanning a line.

1 10. A method as in claim 9 wherein said changing effective  
2 power comprises control of the power level via duty cycle  
3 control.

1 11. A method as in claim 10 wherein said duty cycle  
2 control turns on and off the laser at a specified rate in a  
3 pulsed manner.

1 12. A method as in claim 10 wherein said duty cycle  
2 controls blocks and unblocks the output of the laser at a  
3 specified rate.

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could. 13. A method as in claim 9 wherein said changing comprises  
2 changing a spot size of the beam.

1 14. A method as in claim 1 wherein said defining comprises  
2 examining an existing garment to determine a pattern of  
3 abrasion, and  
4 forming said pattern based on said examining.

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1 15. A method as in claim 14 wherein said forming comprises  
2 automatically forming said pattern.

1 16. A method as in claim 14 wherein said examining  
2 comprises using a scanner to determine color contents of a  
3 section of material, and automatically translating said color  
4 contents into an a value indicative of effective applied energy.

1 17. A method as in claim 16 wherein said translating  
2 comprises using a look up table to change said color contents  
3 into said value indicative of effective applied energy.

18. A method as in claim 1 further comprising using said pattern to control a laser having a total power of 500 watts or greater; and using said laser to form said pattern on a garment.

19. A method as in claim 1 further comprising using said pattern to control a laser having a total power of 1000 watts or greater; and using said laser to form said pattern on a garment.

20. A method as in claim 4 wherein said power of the laser changes by a factor of at least 25% during a single scan line of said laser.

21. A method as in claim 4 wherein said effective applied energy changes by at least 25% during a single scan line of said laser.

22. A method as in claim 1 wherein said defining comprises determining a desired shape for a pattern portion, and painting color contents on said shape being displayed.

1 23. A method as in claim 22 wherein said color contents  
2 represent a degree of abrasion to a specified area on said  
3 garment.

1 24. A method as in claim 22 further comprising defining a  
2 plurality of parameters to be associated with a portion of said  
3 pattern, and defining a section between any two parameters, each  
4 said section being separately changeable.

1 25. A method as in claim 1 further comprising defining  
2 effects for portions of the pattern.

1 26. A method as in claim 25 wherein said effect is a blend  
2 function which computes an average color for pixels based on  
3 colors of a pixel and colors of a neighboring pixel.

1 27. A method as in claim 1 wherein said pattern is a  
2 pattern of a whisker pattern. (

1 28. A method as in claim 25 wherein said effect is a grain  
2 look which allows different colors to have different votes.

1 29. A method as in claim 25 wherein said effect is a spray  
2 look.

1 30. A method as in claim 1 wherein said pattern is a  
2 pattern is a pattern on a garment, only on a specified portion  
3 of the garment, in a location from below the waist to below the  
4 knee on the garment.

1 31. A method as in claim 1 wherein said pattern is the  
2 pattern of a worn seat look on a garment.

1 32. A method as in claim 1 wherein said pattern is oval  
2 shaped with a plurality of concentric portions.

1 33. A method as in claim 1 wherein said pattern includes a  
2 pattern of frayed areas in which actual holes or exposed fibers  
3 will be formed by a laser scribing using said specified  
4 parameters.

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1 34. A method as in claim 1 further comprising forming a  
2 plurality of power levels for a plurality of scan lines to form  
3 said pattern, each said power levels represented by a percent of  
4 a maximum power that can be applied.

1 35. A method as in claim 34 wherein at least one of said  
2 scan lines includes an overshoot protection.

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1 36. A method as in claim 35 wherein said overshoot  
2 protection includes, at an area outside the desired area of  
3 changing the image, which is set to a specified effective  
4 applied power level which is low enough to prevent change to a  
5 material to which the laser is being applied, and application of  
6 the specified effective applied power level until reaching an  
7 area of desired change, and increasing the power at said area of  
8 desired change to a level at which change to the material will  
9 be formed.

1 37. A method as in claim 1 further comprising defining an  
2 orientation of a weave line of the material as part of said  
3 display.



1 38. A method as in claim 1 further comprising passing a  
garment along a conveyor; and using a laser to lase an effect  
3 thereon based on information in said pattern.

1 39. A method as in claim 38 further comprising lasing a  
2 first pattern on a first side of the material on the conveyor,  
3 automatically changing the material to expose a second side to  
4 a laser and then automatically lasing another pattern, different  
5 than the first pattern, on the second side of the material.

1 40. A method as in claim 34 wherein at least a portion of  
2 the lasing is carried out at a level of effective applied power  
3 which does not undesirably damage the material.

1 41. A method comprising:  
2 storing information about effective applied power levels  
3 for a plurality of scan lines of a laser element, at least a  
4 plurality of said scan lines having levels of effective applied  
5 power which change within a single scan line; and  
6 using a laser to process the material by controlling scan  
7 lines of the laser to have a controlled energy density per unit  
8 time which depends on said effective applied power levels.

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1 42. A method as in claim 41 wherein at least a plurality  
2 of said effective applied power levels are values which do not  
undesirably damage the material.

1 43. A method as in claim 42 wherein at least a plurality  
2 of said effective applied power levels are values which  
3 intentionally cause a hole in the material to cause fraying.

1 44. A method as in claim 41 wherein said file is  
2 indicative of a simulated abrasion effect to create a worn look.

1 45. A method as in claim 41 wherein said information is  
2 indicative of simulated whisker effect.

1 46. A method as in claim 41 wherein at least part of said  
2 information is indicative of a simulated fraying effect.

1 47. A method as in claim 41 wherein said garment is a  
2 denim garment.

1 48. A method as in claim 41 wherein said laser has an  
2 output power of 500 watts or greater.

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2 49. A method as in claim 41 wherein said laser is one  
2 which has an output power of 1000 watts or greater.

1 50. A method as in claim 41 wherein said pattern is an  
2 oval shaped pattern.

1 51. A method as in claim 41 wherein said control of  
2 effective applied power levels is carried out by control of duty  
3 cycle of said laser thereby controlling an effect of amount of  
4 power delivered by the laser in a pulsed manner.

1 52. A method as in claim 51 wherein said control of duty  
2 cycle comprises turning a laser on and off at specified rate.

1 53. A method as in claim 52 wherein said specified rate is  
2 fast relative to the movement of the laser.

1 54. A method as in claim 51 wherein said control of duty  
2 cycle comprises selectively blocking and unblocking an output of  
3 the laser to thereby control an effective amount of power  
4 delivered by the laser.

1 55. A method as in claim 41 further comprising changing  
2 the EDPUT by changing a speed of movement of the laser.

1 56. A method as in claim 41 wherein said change of  
2 effective applied power levels comprises changing an output size  
3 of a laser beam that is output from the laser.

1 57. A method as in claim 41 further comprising feathering  
2 an edge of the pattern by changing a power level of the image at  
3 said edge to form a more gradual change of effect at said edge.

1 58. A method as in claim 41, wherein said information is in  
2 a specified format, which includes an indication of an area and  
3 an indication of an effective applied power level to be applied  
4 to said area.

1 59. An apparatus, comprising:

2 a computer controlled laser, having an output which  
3 impinges on a surface to be modified by said laser and which is  
4 controlled according to a computer file, said computer  
5 controlled laser producing said output beam having a controlled  
6 effective applied power level of application to the area,  
7 according to said computer file, wherein said computer file  
8 includes at least a plurality of scan lines in which said  
9 effective applied power level changes within a single scan line  
10 at least three times to at least three different values.

1 60. An apparatus as in claim 59 wherein said laser has a  
2 power output of 500 watts or greater.

1 61. An apparatus as in claim 59 wherein said laser has a  
2 power output of 1000 watts or greater.

1 62. An apparatus as in claim 59 wherein said effective  
2 applied power level is selected for a specific textile material  
3 to be lased, and at least one of said effective applied power  
4 levels in said computer file changes the look of the textile  
5 material without undesirably burning, punching through or  
6 otherwise harming the textile material.

1 63. An apparatus as in claim 62 where at least one of the  
2 effective applied power levels in said computer file does cause  
3 burn through of the material to expose fibers in the material.

1 64. An apparatus as in claim 62 further comprising an in-  
2 line shampooing element, which provides a shampooing operation  
3 and a shampoo removal operation to a garment which has been  
4 lased by the laser.

1 65. An apparatus as in claim 59 wherein an effective  
2 applied power level of the laser is changed by turning on and  
3 off the laser at a specified duty cycle.

66. An apparatus as in claim 59 further comprising an adjustable shutter which modulates an output of the laser, and a control element which turns on and off said shutter, based on said computer file, to adjust said effective applied power level.

67. An apparatus as in claim 66 wherein said shutter is a piezoelectric element.

68. An apparatus as in claim 66 wherein said shutter is a mechanical shutter.

69. An apparatus as in claim 59 wherein said effective applied power level changes to at least five different values in at least a plurality of scan lines of said laser.

70. An apparatus as in claim 59 wherein said effective applied power level changes between a lowest value and a highest value, wherein said highest value is at least 125% of said lowest value.

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1 71. An apparatus as in claim 59 wherein said effective  
2 applied power level changes between a lowest value and a highest  
3 value, wherein said highest value is at least twice said lowest  
4 value.

1 72. An apparatus as in claim 59 wherein said pattern  
2 includes a feathering portion at an edge of the pattern where a  
3 change in effective applied power level is made gradual to  
4 gradually change an effect thereof.

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1 73. An apparatus as in claim 59 further comprising a  
2 control console, having a user interface, said user interface  
3 graphically showing a pattern which is to be lased, said pattern  
4 including differently highlighted areas for different effective  
5 applied power levels.

1 74. An apparatus as in claim 73 wherein said differently  
2 highlighted areas comprise different colors.



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1 75. An apparatus as in claim 59, wherein said computer  
file includes a plurality of information parts, each information  
3 part associated with a specific area on an image representing a  
4 garment to be altered, and each information part including  
5 information indicating effective applied power level information  
6 for a laser.

1 76. An apparatus as in claim 73 wherein said differently  
2 highlighted areas comprise different gray scales.

1 77. An apparatus as in claim 74 further comprising a look  
2 up table which stores a relationship between an effect to a  
3 material, and a duty cycle of operation of the laser to provide  
4 said effect.

1 78. An apparatus as in claim 74 further comprising an  
2 editing tool which enables editing said pattern.

1 79. An apparatus as in claim 59 wherein said memory stores  
2 a pattern of a simulated worn pattern.

1 80. An apparatus as in claim 59 wherein said pattern  
2 stores a simulated whisker pattern.

1 81. An apparatus as in claim 59 wherein said pattern  
2 stores a pattern with a hole through the denim of a type which  
3 exposes fibers of the denim.

1 82. An apparatus comprising:  
2 a controllable laser, which is controllable by a computer  
3 file, to produce an output on a desired area, said laser having  
4 a maximum output power which is 500 watts or greater; and  
5 said computer file storing control information which  
6 adjusts a duty cycle of an output of said laser to control an  
7 effective applied energy applied to said area to a desired  
8 amount and providing said information for a desired energy  
9 density per unit time to said controllable laser for said area.

1 83. An apparatus as in claim 82 wherein said laser is  
2 controlled to scan in lines, and wherein a plurality of said  
3 lines have different effective applied area at one area than in  
4 another area.

1 84. An apparatus as in claim 83 wherein said effective  
2 applied energy changes to at least three different values within  
3 a single scan line.

1 85. An apparatus as in claim 82 wherein at least some of  
2 said effective applied energies is set to a specific value  
3 relative to a material in said area, which changes the abrasion  
4 or color of said material without undesirably damaging the  
5 material.

1 86. An apparatus as in claim 82 where at least part of  
2 said effective applied energies provides a desired punch through  
3 effect in said material.

1 87. An apparatus as in claim 82 further comprising a  
2 terminal, which provides an image of the simulated pattern to be  
3 applied to the material, said image having differently indiciaed  
4 areas to represent different effective applied energies.

1 88. An apparatus as in claim 87 wherein said indiciaed  
2 areas comprise differently colored areas.

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1 89. An apparatus as in claim 87 wherein said indiciaed  
2 areas comprise different grayscales.

1 90. An apparatus as in claim 82 further comprising a duty  
2 cycle controller comprising and on off control for the laser.

1 91. An apparatus as in claim 82 further comprising a duty  
2 cycle controller comprising a shutter, selectively opened and  
3 closed at an output of the laser.

1 92. An apparatus as in claim 87 wherein the stored pattern  
2 has a plurality of concentric oval areas.

1 93. A method of processing a garment, comprising:  
2 obtaining a first garment which has a desired look to be  
3 replicated;  
4 using an electronic device to capture color levels of  
5 different areas of said first garment;  
6 automatically determining, from said color levels, an  
7 amount of effective applied energy of laser energy which will  
8 need to be applied to said each of said area to replicate said  
9 color level; and  
10 forming a computer file representing said amount of laser  
11 power which needs to be applied to each of said areas to  
12 replicate said different areas of said first garment.

1 94. A method as in claim 93 further comprising using said  
2 computer file to control a laser to mark a second garment in a  
3 way that replicates a pattern of the colors on the first  
4 garment.

1 95. A method as in claim 94 wherein said laser marks said  
2 second garment by scribing a plurality of lines on said second  
3 garment using said computer file.

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1 96. An apparatus as in claim 95 wherein at least a  
2 plurality of said lines define an effective applied energy which  
3 varies within each of a plurality of single scanned lines.

1 97. An apparatus as in claim 96 wherein said effective  
2 applied energy varies to at least three different values within  
3 said plurality of lines.

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1 98. A method as in claim 94 wherein said translating  
2 comprises using a look up table which stores a correspondence  
3 between a specified color and a specified effective applied  
4 energy, to determine said power levels.

1 99. A method as in claim 94 further comprising storing  
2 information in a look up table, and using said information to  
3 determine said effective applied energy for each of said areas.

1 100. A method as in claim 94 wherein said using a laser  
2 comprises adjusting said effective applied energy by adjusting a  
3 duty cycle of an output of said laser at a speed which is fast  
4 relative to a speed of movement of said laser, and in a way  
5 which adjusts an effective power output of said laser within a  
6 single scan line.

1 101. A method as in claim 100 wherein said duty cycle  
2 control comprises turning the laser on and off at a specified  
3 rate.

1 102. A method as in claim 100 wherein said duty cycle  
2 control comprises selectively blocking and unblocking an output  
3 of the laser.

1 103. A method as in claim in 94 wherein said laser has an  
2 output power of 500 watts or greater.

1 104. A method as in claim 93 further comprising displaying  
2 a graphical image indicative of said computer file to a user and  
3 allowing said user to edit said graphical image to thereby edit  
4 said computer file.

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1 105. A method as in claim 104 wherein different areas of  
said computer file have different indicia indicative of  
3 different amounts of power to be applied to said area.

1 106. A method as in claim 95 further comprising allowing  
2 setting a direction of line scribing by said laser.



1 107. A method comprising:  
2 determining information indicative of a desired abrasion  
3 pattern to be formed on a garment;  
4 storing, in a memory, a relationship between each of a  
5 plurality of desired areas of abrasion and an effective applied  
6 power to be used with a specified laser to create said level of  
7 abrasion;  
8 accessing said relationship, using said information  
9 indicative of said desired abrasion pattern, to determine said  
10 effective applied power; and  
11 forming a computer file using said effective applied power  
12 and said desired pattern, said computer file including an  
13 indication of an area, and an indication of information which  
14 will cause said specified laser to apply said effective applied  
15 power in said area.

1 108. A method as in claim 107 wherein said effective  
2 applied power is an indication of a duty cycle of an output of  
3 said laser.

1 109. A method as in claim 107 further comprising displaying  
2 a graphical representation of said computer file to a user,  
3 where different indicias in different areas of said image  
4 represent different amounts of abrasion; and enabling said user  
5 to edit said graphical representation.

1 110. A method as in claim 109 wherein said indicias  
2 comprise different colors, each color associated with a  
3 specified power level and associated with a specified degree of  
4 abrasion.

1 111. A method as in claim 107 further comprising using a  
2 laser to apply said desired effective applied power level to a  
3 desired garment.

1 112. A method as in claim 111 wherein said using comprises  
2 defining lines that the laser will follow in scanning the image,  
3 and wherein at least a plurality of said lines have a varying  
4 effective applied power within the specified line.

1 113. A method as in claim 112 wherein at least a plurality  
2 of the lines have an effective applied power that varies at  
3 least three values within the scanning of the line.

1 114. A method as in claim 112 wherein said using comprises  
2 adjusting a duty cycle of the laser to change an amount of  
3 effective applied power that is applied.

1 115. A method, comprising:  
2 defining a desired pattern of color alterations to be  
3 formed to a garment by selecting a plurality of areas on a  
4 display, defining a color that is associated with each of a  
5 plurality of abrasion levels, selecting a color to associate  
6 with each of the plurality of areas to thereby associate a level  
7 of abrasion with each of the plurality of areas; and  
8 storing a computer file indicative of said selecting.

1 116. A method as in claim 115 further comprising enabling  
2 said display to be edited, to change color and or shape.

1 117. A method as in claim 116 wherein said computer file  
2 specifies information for use in forming control data for a  
3 laser to scribe lines on a desired garment, wherein at least a  
4 plurality of said lines specify an energy density per unit time  
5 which changes within a single scan line.

1 118. A method as in claim 117 wherein at least a plurality  
2 of lines have an energy density per unit time which has at least  
3 three values within the specified line.

1 119. A method as in claim 118 wherein a highest of said  
2 three values is at least 1.25 times as high as a lowest of said  
3 three values.

1 120. A method as in claim 116 wherein said editing  
2 comprises applying an abrasion using a spray tool.

1 121. A method as in claim 116 wherein said editing  
2 comprises decreasing a resolution of said image.

1 122. A method as in claim 115 further comprising storing,  
2 in a memory, a relationship between each color and an amount of  
3 effective applied energy representing the color.

1 123. A method as in claim 116 wherein said using a laser  
2 comprises controlling the laser to control an effective applied  
3 power applied to an area by controlling a duty cycle of the  
4 laser.

1 124. A method as in claim 123 wherein said duty cycle is  
2 controlled by selectively blocking and unblocking an output of  
3 said laser.

1 125. A method as in claim 123 wherein said duty cycle is  
2 controlled by turning on and off the laser.

1 126. A method, comprising:  
2 defining an image of a whisker part which represents an  
3 image of a color change to a material caused by creasing of the  
4 material; and  
5 using a laser to simulate the look of said whisker part on  
6 the material.

1 127. A method as in claim 126 wherein said whisker part  
2 comprises a plurality of lines that represent the creases.

1 128. A method as in claim 127 wherein each of the whiskers  
2 are between 1/8th of an inch and 2 inches in width and between  
3 one and ten inches in length.

1 129. A method as in claim 126 wherein each of the lines is  
2 a different color in the center then along the top, bottom and  
3 towards its edges.

1 130. A method as in claim 126 wherein said forming  
2 comprises allowing a user to form a desired view of the whisker  
3 on a user interface; and

4 converting the image on the user interface to a computer  
5 file used to control the laser.

1 131. A method as in claim 126 wherein said forming the  
2 whisker comprises using a laser having a maximum output power of  
3 500 watts or greater to form a pattern.

1 132. A method as in claim 131 wherein said pattern is  
2 formed in a way which does not undesirably damage the material.

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1 133. A method of processing a garment, comprising:  
2 defining a desired pattern to be formed on the garment and  
3 producing a computer file indicative thereof;  
4 using said computer file with a laser having a maximum  
5 output power of 500 watts or greater, to scribe the desired  
6 pattern on said garment; and  
7 using said laser for thirty seconds or less to form said  
8 entire pattern.

1 134. A method as in claim 133 further comprising  
2 controlling an effective output power of said laser by  
3 controlling a duty cycle of operation thereof.

1 135. A method of forming a pattern on a garment comprising:  
2 determining a pattern to be formed on a garment;  
3 determining an effect that a directional characteristic of  
4 the material will have on the pattern to be formed; and  
5 specifying both said pattern and said directional  
6 characteristic.

1 136. A method as in claim 135, wherein said specifying  
2 includes forming a computer file indicative of areas, and  
3 effective power output levels associated with each said area.

1 137. A method as in claim 136, further comprising using  
2 said computer file to control a controllable laser, to form an  
3 effect on a material.

1 138. A method of processing a garment, comprising:  
2 obtaining a first garment which has a desired look to be  
3 replicated;  
4 determining color levels of different areas of a plurality  
5 of different areas of said first garment;  
6 determining, from said color levels, an amount of effective  
7 applied energy of laser energy which will need to be applied to  
8 said each of said area to replicate said color level; and  
9 forming a computer file which has a plurality of area  
10 representations, each area representation associated with a  
11 power representation representing said amount of laser power  
12 which needs to be applied to each of said areas to replicate  
13 said different areas of said first garment.



1 139. A method as in claim 138 further comprising using said  
2 computer file to control a laser to mark a second garment in a  
3 way that replicates a pattern of the colors on the first  
4 garment.

1 140. A method as in claim 138 wherein said laser marks said  
2 second garment by scribing a plurality of lines on said second  
3 garment using said computer file.

1 141. An apparatus as in claim 140 wherein at least a  
2 plurality of said lines define an effective applied energy which  
3 varies within each of a plurality of single scanned lines.

1 142. A method as in claim 138 further comprising storing  
2 information in a look up table, and using said information to  
3 determine said effective applied energy for each of said areas:

1 143. A method as in claim 138 further comprising displaying  
2 a graphical image indicative of said computer file to a user and  
3 allowing said user to edit said graphical image to thereby edit  
4 said computer file.

1 144. A method, comprising:  
2 defining an image of a whisker part which represents an  
3 image of a color change to a material caused by creasing of the  
4 material; and  
5 forming a computer file which indicates said whisker part,  
6 and which which represents at least a plurality of areas, and  
7 laser information for said areas, said laser information for  
8 said areas being information which will cause said laser to form  
9 a specified color change of material in said areas.

1 145. A method as in claim 144, further comprising applying  
2 said computer file to a laser to simulate the look of said  
3 whisker part on the material.

1 146. A method as in claim 144 wherein said whisker part  
2 comprises a plurality of lines that represent the creases, each  
3 of the lines are between 1/8th of an inch and 2 inches in width  
4 and between one and ten inches in length.

1 147. A method as in claim 144 wherein each of the lines is  
2 a different color in the center then along the top, bottom and  
3 towards its edges.

1 148. A method comprising:

2 defining a pattern to be formed on a textile material,  
3 which pattern represents different degrees of abrasion of said  
4 textile material at different locations, and which represents at  
5 least first areas which have no abrasion, and producing a  
6 computer readable file indicative of said pattern; and

7 controlling a laser to form said pattern by first  
8 controlling said laser according to said file to produce an  
9 effective output power in said first areas which is greater than  
10 zero, but is less than a threshold beyond which a visible change  
11 will be made to said textile material, and to increase the  
12 effective output power at a boundary between said first areas,  
13 and other areas outside said first areas.

1 149. A method comprising:

2 defining a pattern to be formed on a textile material,

3 which pattern represents a plurality of sections, each section

4 having a separately controllable amount of degree of change,

5 said different degrees of change including at least a plurality

6 of different levels of change;

7 randomizing a precise point at which the degree of change

8 actually is bounded between two adjacent levels; and

9 forming a computer-readable file indicating said pattern

10 and information about said degree of change, including the

11 randomized boundary.

1 150. A method as in claim 149, wherein said degree of

2 change information is information about an effective applied

3 power level for a laser, and said file includes said information

4 associated with location information.

1 151. A method as in claim 150, further comprising using a

2 laser to apply said effective applied power levels at specified

3 locations represented by said location information.

1 152. A method comprising:

2 defining a pattern to be formed on a textile material,

3 which pattern has different colors representing different  
4 degrees of change of said textile material at different

5 locations, said different degrees of change including at least a  
6 plurality of different levels of change, each different level of  
7 change associated with an effective applied energy to be applied  
8 to said location;

9 defining a tool which allows a spray of incremental  
10 intensity onto the pattern, by defining a droplet size and  
11 trajectory, determining a location that is hit by a droplet;  
12 adjusting a color level of said location based on said hit so  
13 that said effective applied energy is adjusted by said hitting.

1 153. A method as in claim 152, wherein said colors are one  
2 of full colors or gray scales.

1 154. A method as in claim 152, wherein said locations are  
2 pixels.

1 155. A method as in claim 152, wherein said adjusting  
2 comprises incrementing a color level of said location to a next  
3 higher color level.

1 156. A method as in claim 152, wherein said effective  
2 applied energy is one of an energy density per unit time, a duty  
3 cycle of an output of a laser, a speed of movement of a laser, a  
4 distance of a laser or a number of passes of a laser.

1 157. A method as in claim 152, wherein said adjusting  
2 comprises incrementing a color level of said location to a next  
3 lower color level.

1 158. A method of providing a variable effect to a material,  
2 comprising:

3 changing an effective applied power from a laser to a  
4 material by making multiple passes of laser scans along specific  
5 segments of the pattern, each of said passes being carried out  
6 at constant power, speed and laser distance, but the combination  
7 of said multiple scans providing a varied effective applied  
8 power at said material.

1 159. A method as in claim 158, wherein said changing  
2 comprises defining a file having different levels of effective  
3 applied energy, and using said file to control a number of said  
4 passes which are carried out in each of a plurality of areas.

1 160. A method as in claim 159, wherein said areas are  
2 pixels.

1 161. A method as in claim 2, wherein said effective  
2 applied energy is one of an energy density per unit time, a duty  
3 cycle of an output of a laser, a speed of movement of a laser,  
4 or a distance of a laser.

1 162. A method as in claim 41, wherein said effective  
2 applied energy is one of an energy density per unit time, power  
3 level of a laser, a duty cycle of an output of a laser, a speed  
4 of movement of a laser, or a distance of a laser.

1 163. A method as in claim 93, wherein said effective  
2 applied energy is one of an energy density per unit time, power  
3 level of a laser, a duty cycle of an output of a laser, a speed  
4 of movement of a laser, or a distance of a laser.

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1 164. A method as in claim 107, wherein said effective  
2 applied energy is one of an energy density per unit time, power  
3 level of a laser, a duty cycle of an output of a laser, a speed  
4 of movement of a laser, or a distance of a laser.

1 165. A method as in claim 150, wherein said effective  
2 applied energy is one of an energy density per unit time, power  
3 level of a laser, a duty cycle of an output of a laser, a speed  
4 of movement of a laser, or a distance of a laser.

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1 166. An apparatus as in claim 59, wherein said effective  
2 applied energy is one of an energy density per unit time, power  
3 level of a laser, a duty cycle of an output of a laser, a speed  
4 of movement of a laser, or a distance of a laser.

1 167. An apparatus as in claim 82, wherein said effective  
2 applied energy is one of an energy density per unit time, power  
3 level of a laser, a duty cycle of an output of a laser, a speed  
4 of movement of a laser, or a distance of a laser.



1 168. A file format, comprising:

2 a representation of a matrix of values, each value

3 representing an amount of effective applied power to be applied

4 to each area defined by each element of the matrix.

1 169. A format as in claim 168, wherein each element of

2 said matrix is bit-mapped.

1 170. A format as in claim 168, wherein each value

2 represents at least one of power level, duty cycle and or energy

3 density per unit time for each of said areas.

1 171. A format as in claim 168, wherein each said area is a

2 pixel.

1 172. A format as in claim 168, wherein said format also

2 includes a value from which a direction of scanning by a laser

3 should be carried out.

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173. A file format, comprising:

a representation of a matrix of values, each value  
3 representing an amount of power to be applied by a laser to each  
4 area defined by each element of the matrix; and  
5 a control value for said laser, indicating a direction of  
6 laser scanning.

1 174. A format as in claim 173, wherein said direction is  
2 one of horizontal or vertical scanning.

1 175. A method comprising:  
2 authoring a special image intended for use in changing the  
3 color of textile fabric, which has differently colored areas  
4 representing different levels of change of color to said textile  
5 fabric; and  
6 using said image to form a file that controls a laser to  
7 carry out said changing of color of said textile fabric.

1 176. A method as in claim 175, wherein said file includes  
2 levels of effective applied energy associated with said levels  
3 of change of color.

1 177. A method as in claim 176, wherein said effective  
2 applied energy is one of an energy density per unit time, power  
3 level of a laser, a duty cycle of an output of a laser, a speed  
4 of movement of a laser, or a distance of a laser.

1 178. A method as in claim 175, wherein said file includes  
2 a separate effective applied energy value for each pixel of the  
3 image.

1 179. A file format, comprising:  
2 a matrix of values, each value associated with an area and  
3 having a value which indicates an amount of lasing to be carried  
4 out by a laser, which matrix of values collectively forms  
5 information which can be used to use said laser to form a  
6 whisker on a material, said whisker representing a color change  
7 to a material caused by creasing of the material.